GLAST Monthly PSR

Safety and Mission Assurance

Safety & Mission Assurance Manager: Ron Kolecki
Project Lead QE: Tavi Alvarez/Honeywell
GSFC ACD QE: Alton Lacks/Honeywell
Software QE: David Harmon/Tybrin
QE at Spectrum Astro: Mark Kunda/Honeywell
QE at SLAC: Tracy Shepherd/Honeywell
Safety: Dave Bogart/PSM/302 & Jim Anderson/SRS
Reliability Engineer: Tony DiVenti/Honeywell
Parts: Thom Perry/QSS
Materials: Pilar Joy/541 & Fred Gross/Swales

April 2004

Accomplishments

- ***Software***
  - Working with Spectrum to define their Software Supplier Management Process for the FSW CDR. This involves identifying the software being supplied by third parties, the CM processes being used, and methods to be used for testing.
  - Reviewed the Spacecraft FSW CDR package and provided inputs.
  - Reviewed the latest spacecraft flight software metrics package. No measurements warrant concern.

Issues/Problems

- ***Software***
  - Reviewed IV&V comments concerning the Spacecraft Software Design Document. IV&V is concerned about traceability and completeness. A telecon with IV&V will be taking place on 4/7/04 to address this issues.
  - Spectrum needs to define how they handle software from it's suppliers (e.g. Star Tracker software)

Accomplishments

- ***Safety***
  - Working with Spectrum Astro Launch Vehicle Interface Manager to complete changes to the PHA and submit to the Range.
  - PSM and SE are continuing to put together the preliminary MSPSP with a target date of late May for review and submission.
  - Attended Propulsion CDR at ARC; Spectrum Astro has put ARC's request for relief on the number of x-rays on hold as premature.
  - Attended Systems Engineering and I&T Peer Reviews at SAI; discussions of MGSE on hold for Analysis Peer Review 4/14/04.
  - Attended Structural, Thermal and Mechanism Peer Reviews at SAI; no significant issues for Safety.
  - Attended Factory of the Future review; Safety is on track monitoring new installation of Environmental Testing facilities, providing safety equipment and keeping track of new and updated procedures.

Issues/Problems

- ***Safety***
  - Possible lifting of the Observatory using lifting points below the center of gravity (CG). Design of a lifting fixture that will effectively lift from above the CG is under way at Spectrum Astro. Looking to the I&T portion of the Peer Review to help resolve this. Need results of the stability analysis of the MGSE. Analysis Peer Review is scheduled for 4/14/04. Good results from the analysis should provide information to settle this issue.

Accomplishments

Reliability

- Completed ACD reliability model modifications to better examine sensitivity associated with potential PMT glass fracture failures. Monte Carlo simulation analyses was employed to more accurately reflect the physical relationship between the tiles, shells, and PMTs. Current fall out margin projections for the glass fracture failure mode estimated between 1.5 to 3.0%.
- Completed with Len Wang/Materials an independent assessment of GPS reliability given design changes associated with the new L1 antenna patch design. Unfortunately, General Dynamics (GD) did not provide sufficient information to verify ceramic filter solder joint reliability or the adequacy of GD's recommendation to tighten GPS thermal limits. Information was provided, however, generating more questions about material selection for the antenna's PWB.
- Supported the GLAST Systems Peer Review held at SAI and provided recommendations to the SAI reliability engineer on completing and integrating corresponding analyses activities with the development team prior to the upcoming reliability Peer Review.
- Verified LAT DC-to-DC converter over-voltage protection consisting of zenor diodes and redundancy tolerance at the tower/ box levels.

Issues/Problems

Reliability

- Need to insure that findings/recommendations resulting from spacecraft reliability analyses (e.g., FMEA, PRA) are adequately reviewed and integrated with the entire spacecraft development team. More insight should be provided at the Reliability Peer Review that SAI informally agreed to have as a result of the RFA generated at the Systems Peer Review.
- Although SAI has moved to the Nero-Gold style potentiometers in both their Ku band and solar array drive antenna to mitigate potential on-orbit noise issues, need to continue working with GSFC and supplier personnel to insure that root cause is identified and that all appropriate actions are being taken to address other potential noise contributors (i.e., cleanliness of the assembly environment, controlled processes of variables affecting mechanical potentiometer properties). Also need to review potential science impact resulting from potentiometer noise in the Ku-Band with appropriate project personnel.
- Need to continue identifying, reviewing, and mitigating (as applicable) risks associated with SAI's introduction of non-heritage elements (e.g., SSIRU, IR Power Converters, GPS Receiver Antenna, Solar Array Deployment) into the GLAST spacecraft design.
- The LAT FMEA report needs to be finalized and placed on the SLAC website. Need to insure with LAT personnel that no critical failure modes have been accidentally missed.
- Need to verify that LAT parts stress and derating analyses have been successfully completed.

Upcoming Events

- ***Reliability***
  - Continue supporting ACD PMT glass fracture analyses presentations and report development.
  - Support upcoming spacecraft CDR preparation meetings, including the SAI reliability analyses Peer Review. Will help insure that reliability analysis activities are integrated with the design and development process.
  - Work with Chris Connor and the team in finalizing plans associated with Betatronix potentiometers.
  - Assist SLAC in finalizing the LAT FMEA report.
  - Hold meeting with ACD team to insure necessary helium contamination controls are in place. Will coordinate with Art Whipple.
  - Continue supporting reviews/analysis of non-heritage elements being introduced in the spacecraft design.

Accomplishments

Parts & Materials

- The AVX AOL-1863-01 capacitors arrived. These were procured as replacements for the CalRamic 500V capacitors that failed life testing. These parts are used on the ACD High Voltage Bias Supply (HVBS) board.
- Sponsored several important radiation telecons this month between SLAC, NRL, ACD, Code 561, Code 562, and the Project Office. The first was a workshop to identify and schedule all remaining LAT parts needing radiation testing. Except for a National transceiver requiring Single Event Effects (SEE) testing, the remaining parts (14) require Total Ionizing Dose (TID) testing. The second telecon was held to discuss the TID results for the MAX494ESD that failed after annealing, which is a 1-week, room temperature, post-irradiation treatment. These parts will be retested the week of April 5th.
- ACD GAFE screening is nearing completion in the Code 562 T&A Laboratory. Out of 813 chips tested, the yield at initial electrical testing was 73%. Eight of 10 scheduled burn-in runs have been completed (480 chips), and the yield then drops to 51% after 3-temp post burn-in electricals. Qualification testing is in progress.

Accomplishments

- ***Parts & Materials (Continuing)***
  - The project delivered 126 tested GARC ASICs (room temperature only) plus an additional six for DPA. The first burn-in run (12 devices) in the Code 562 T&A Laboratory has been completed with one failure attributed to bent leads. Temperature testing is ongoing.
  - GLAST GBM asked for assistance in locating various acceptable flight parts due to budgetary constraints. A total of 15 line items were donated by various projects from their flight stores, kitted, and delivered to the project for shipment to Germany.
  - Working with the various subsystem managers, SLAC QA, Spectrum Astro and GBM to determine mitigation plans for several recently issued GIDEPs and NASA Advisories that are impacting the project, particularly the Actel 54SX-S FPGAs.
  - Tyco Amp ring terminals procured for the ACD FREE board were solder dipped by the Code 562 T&A Laboratory because of a pure tin finish.
  - Formally signed off on LAT-TD-02656, which is the LAT DAQ ASICs screening and qualification test plan. Screening of these ASICs will be performed by SLAC, but qualification testing will be done in the Code 562 T&A Laboratory.

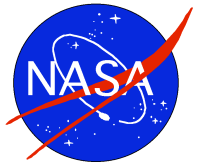
Accomplishments

- ***QE Resident at SLAC***
  - A DOE / NASA Lehman Review was held at the Stanford Linear Accelerator Center (SLAC) on March 31 & April 1 2004. Current Status and project overview were the main topics discussed.
  - Flight production for the Tracker MCM circuit card assemblies has begun at Teledyne Electronics. The First set of flight circuit cards are scheduled for delivery to SLAC on April 20th or 21st .

Issues/Problems

- ***QE Resident at SLAC***
  - A qty of 44 Bias Circuits were received with .50 oz copper foil. The copper foil should be .25 oz copper per the fabrication drawing. A non-conformance report was initiated and the final disposition for the 44 bias circuits were Use as Is.
  - 14 out of 121 MCM board coupons have failed Goddard testing for inadequate or missing internal annular rings. All bare boards affected by the non-conforming coupons have been located and downgraded to non-flight status.
  - After completion of the GSFC audit in Jan of 2004, 26 Audit observations were documented for review. Corrective Action responses were provided to the GSFC audit team members on March 4, 2004. After reviewing the responses, GSFC was able to close 19 observations, 7 observations are still open due to various issues. The resident QE is working these issues with SLAC Quality Management.

Upcoming Events



- ***QE Resident at SLAC***
  - SLAC QA surveillance of Machining processes at Tapemation for the Flight spare Grid.
  - The Radiator Heat pipe burst test is scheduled for Mid April at the Lockheed Martin facility in Sunnyvale, Ca.

Accomplishments

QE Resident at Spectrum

- The resident QE and the Spectrum QE are working with their Start Tracker's supplier on getting the failure reports and corrective actions. After these documents are reviewed they will be forward to GSFC with their recommendations.

- BAE RAD 750 Press Fit Connector BAE has reached agreement with Spectrum on the use of ERNI connectors on the RAD 750.

- Potential Tin-Whisker issue identified on NPP and its relevance to GLAST_ - General Dynamics supplies the GPS receiver, and was audited by GSFC and Spectrum Astro personnel and it was suggested to General Dynamics to add a Uralane coating, and this was determined to leave As-Is similar to the decision made by the NPP Project. This issue is considered closed .

- Resident QAE continued reviewing plans, and procedures in addition to any Material Review Board (MRB), and or Failure Review Board (FRB) actions.

- A request has been made to SAI to provide copies of qualification test plans, test records, and acceptance test plans for all procured and in-house build hardware items for government review before the CDR.

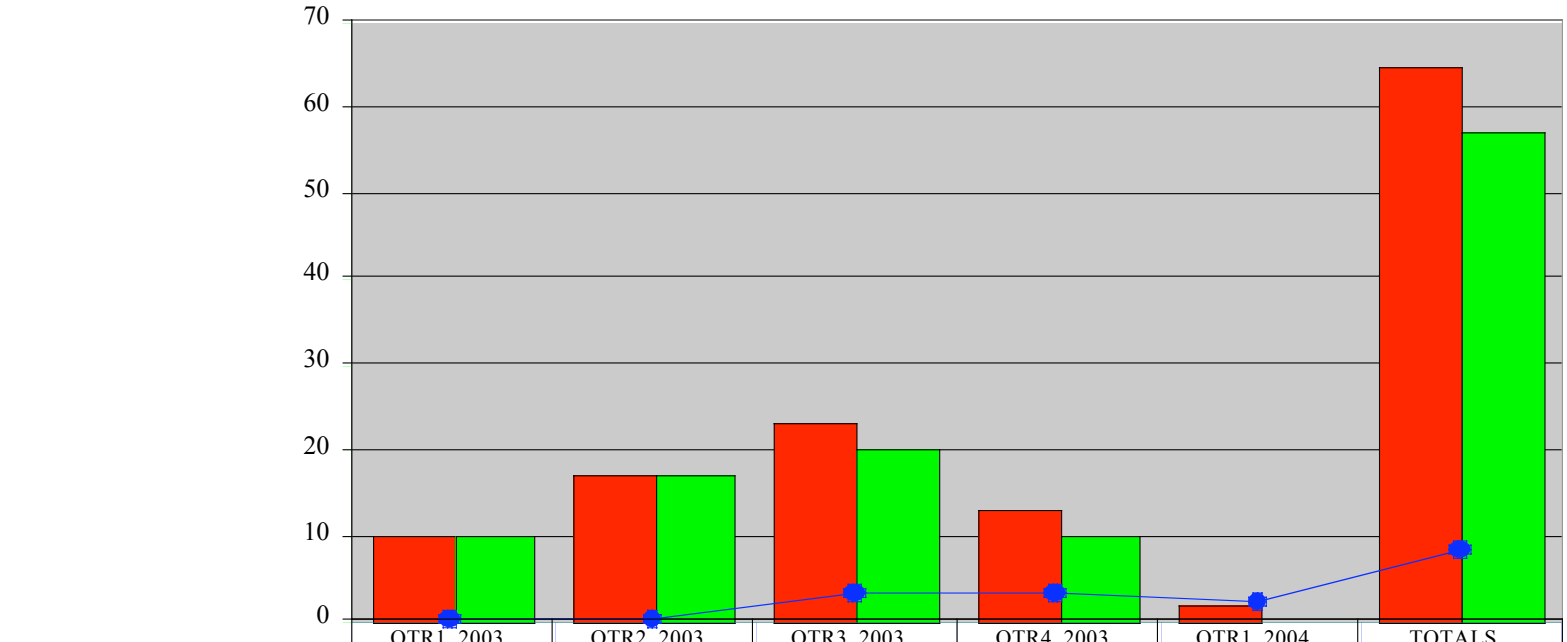
Upcoming Events

- ***QE Resident at Spectrum***
  - Participate on the MRR for the SSIRU and assure that the concerns expressed during the design review held at the Northrop-Grumman on January 22, 2004 have been addressed.
  - Participate on the Solar Array Drive Assembly (SADA) and the Antenna Pointing Mechanism (APM) CDRs at Moog Schaeffer Magnetic Division in Chatsworth, CA on the second week of April 2004.
  - There will be a Reliability Peer Review at SAI the last week in April, after the CDR dry run.

Accomplishments

- ***QE Resident at Spectrum***

GLAST QAR STATUS



	QTR1 2003	QTR2 2003	QTR3 2003	QTR4 2003	QTR1 2004	TOTALS
QARS OPENED	10	17	23	13	2	65
QARS CLOSED	10	17	20	10	0	57
OPEN AT PERIOD END	0	0	3	3	2	8

Accomplishments

- ***QE Resident at Spectrum***

GLAST 10 MOST RECENT QARS CLOSED

	QAR #	Open Date	Part Number	Serial No.	Manufacturer	Summary of Non-Conformance	F / NF	Close Date
1	11963097	10/16/03	BE-546922-001	2-2, 2-3	Coretec	ARM Board has surface spots bridging the traces.	F	11/08/03
2	11963104	10/20/03	BE-551283-001	3, 5 and 6	Cirtech	PDU Backplane failed GSFC Coupon Test. Had separation between internal layers.	F	11/08/03
3	11963016	09/02/03	JANTXV1N4460US	LDC 0135	Microsemi	Failed DPA on Diode. Inadequate Die Attach.	F	11/24/03
4	11962956	07/30/03	JANTXV2N2222A	LC 0305	Semicoa	Failed DPA on Transistor. No wire bonds or evidence of attempt at wire bond.	F	11/25/03
5	11963018	09/02/03	JANTXV1N6642U	LDC 9923 and LDC 0149	Microsemi	During DPA Test, Diode LDC's were mixed.	F	11/25/03
6	11962998	08/25/03	IRHM57160SCS	LDC 0327	International Rectifier	Transistor Power MOSFET has not yet completed Group B and C Testing.	F	12/04/03
7	11963015	09/02/03	JANTXV2N6849	LDC 0307	International Rectifier	Failed PIND Testing on P Channel Mosfet Transistor.	F	12/08/03
8	11963196	12/05/03	DM-148189-001	N/A	Spectrum Astro	No tiodize in reworked area of SA root hinge latch.	F	12/16/03
9	11963193	12/15/03	605114, 605115, 605116, 605117	TBD	Emcore	Request to use silver plated copper wire and materials (ink & adhesive) that do not meet outgassing requirements.	F	02/10/04
10	11963201	12/29/03	Various	Various	Spectrum Astro	Per PPL-21, the operating junction temp can not exceed 93.5C for any silicon linear micro circuit.	F	02/10/04

Accomplishments

- ***QE Resident at Spectrum***

GLAST OPEN QARS

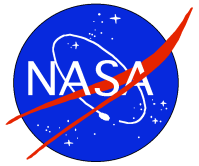
	QAR #	Open Date	Part Number	Serial No.	Manufacturer	Summary of Non-Conformance	F / NF	Close Date
1	11963017	09/02/03	RT54SX32S1CQ208B	LDC 0246	Actel	Failed DPA on Microcircuit. Bond Pull.	F	
2	11963032	09/10/03	JANTXV1N6642US	LDC 0141	Microsemi	Failed DPA on Glass Diode. Hermeticity Testing revealed dye penetration.	F	
3	11963052	09/18/03	93-1377-R	LDC 031960962 (PO)	International Rectifier	International Rectifier found lead brazing on MOSFET Transistors. Lot is suspect. RTV.	F	
4	11963162	11/21/03	Supplier Survey	N/A	Rantec Microwave	Several noncompliances with corrective action response times.	F	
5	11963176	12/03/03	JANTXV1N6114AUS	LDC 9924	Microsemi	Failed DPA on Glass Diode. Had less than 80% silicon after scribe and break.	F	
6	11963186	12/09/03	JANTXV1N5806US	LDC 0030	Microsemi	Per GIDEP Advisory, had glass diodes from suspect LDC. Incorrect cathode band mark.	F	
7	11963210	01/06/04	FMC-461F/883	LDC 0334T	Interpoint	Failed PIND on DC/DC Converters.	F	
8	11963246	02/10/04	5962-8776001BSA	LDC 0152A	National Semi	Failed PIND on IC Octal Buffer.	F	

Anticoincidence Detector

- **ACD Tile Shell Assembly**
  - The four sides and Top shell composite panels have been assembled to form the Composite Shell Assembly.
  - The bonding of the doublers and flexures on the top panel is nearly complete.
  - Presently the Tile Shell Composite Assembly is being prepped for corner and mid-span flexure insert bonding.

- **ACD Resistor Network Cards**
  - Quantity of 30 redesigned Rigid Flex Boards were received at Goddard and will be tested as prototype resistor network boards.
  - 13 resistor network boards have completed electrical and 50 thermal cycles tests.

Anticoincidence Detector



- **Resistor Network Card Con't**
  - The 13 resistor network card have passed the corona effects test between board layers and flex cables.
  - One network card has been assembled into the PMT housing for a more stringent corona test at higher voltages in vacuum testing.

- **ACD Photomultiplier Tube (PMT) Failure Mode Investigation**
  - Five non-flight PMT's were thermal vacuum tested and inspected.
  - Results of the inspection were no cracks in the glass seal or gas leaks revealed.
  - Presently the PMT's are being mechanically prepped for Qualification Vibration Tests.

Anticoincidence Detector

- **Capacitor Life Test Failure**
  - Capacitor p/n CR2204-1, 500 volt was replaced with the AVX capacitor p/n AOL-1863-01, a 600 volt part.
  - The 600 volt cap is scheduled for High Acceleration Life Testing when the test chamber is on line.
  - One hundred of the 600 volt caps were Corona tested in Bldg. 20 and passed.
- **ACD GARC ASIC Reset Anomaly**
  - Problem found when electrically testing the FREE Card.
  - MRB held on 3/9/04 Goddard and SLAC to discuss reset anomaly.
  - Goddard presented a resistive cross strapping approach of the GARC receiver circuits for side A and B clocks and reset circuits, along with a suggestion to make change in the GASU driver by SLAC.
  - Both parties agreed suggested fix is acceptable.
  - Goddard awaiting emergency change request from SLAC to move forward on FREE Card modification.

Anticoincidence Detector

- ***ACD Base Frame Assembly***
  - PR was close on the Keensert hole anomaly 3/16/04.
  - The PFR on the six hole shift fix remains open until LAT updates their Interface Dimensional Drawing to reflect the change.

- ***ACD Tile Detector Assembly***
  - A Rapid Pump Down test was performed on 3/15/04 on 2 bent tiles and 4 flat tiles.
  - The six assemblies were checked after thermal vacuum for light tightness to determine if we had leaks, they all met requirements.